Express Mail Label No. EL 798 273 495 US PATENT

Docket No. 11196.39/mkh

UNITED STATES PATENT APPLICATION

of

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for

INFLATABLE OBSERVATION TOWER AND METHOD FOR ERECTING AN INFLATABLE OBSERVATION TOWER

FIELD OF THE INVENTION

The present invention pertains generally to cold air inflatable structures and methods for erecting inflatable structures. More particularly, the present invention pertains to inflatable towers. The present invention is particularly, but not exclusively, useful as an inflatable tower for establishing an elevated observation platform.

BACKGROUND OF THE INVENTION

It is often desirable to loft an electronic payload to an elevated position and maintain the payload at an elevated position for an extended period of time. Typical electronic payloads can include, but are not necessarily limited to sensors, communications antennas and relay equipment, electronic jamming devices, observation devices such as cameras and radars, and other devices that can take advantage of an elevated position. Typical applications of such electronic devices include telecommunications, electronic warfare, imagery collection, scientific study, television operations, and perhaps most importantly, wide area surveillance. More recently, there has been an increased demand to provide temporary, wide area surveillance for the purpose of security in both military and civilian environments.

Many of these applications require an elevated platform to be established quickly, with little notice, and without regard to weather conditions. In addition, for some (if not all) of the above-described applications including wide area surveillance, it is sometimes desirable to loft relatively heavy payloads (e.g. payloads weighing 100 pounds or more) to relatively high elevations (e.g. elevations of 100 feet or more). In all cases, it is desirable to loft the payload rapidly and with minimal personnel requirements.

One factor that must be considered when contemplating the lofting of relatively large payloads to relatively high elevations is wind. Specifically, wind can be a concern during payload lofting, and in addition, once the

payload has reached the desired elevated position, at which time it is generally desirable to maintain the payload as stationary as possible. Indeed, such systems are often required to remain operational at wind speeds of 35 knots or more and survive wind speeds or 50 knots or more without damage. Moreover, higher wind speeds are typically experienced at higher payload elevations.

In light of the above, it is an object of the present invention to provide systems and methods for lofting relatively heavy electronic payloads to substantially stationary positions at relatively high elevations. It is another object of the present invention to provide inflatable structures and methods for erecting inflatable structures capable of quickly lofting an electronic payload with minimal personnel. Yet another object of the present invention is to provide inflatable structures and methods for erecting inflatable structures which can remain operable in strong winds and survive even larger wind gusts. Still another object of the present invention is to provide systems and methods for lofting relatively heavy electronic payload which are easy to use, relatively simple to implement, and comparatively cost effective.

SUMMARY OF THE INVENTION

The present invention is directed to an inflatable tower system for establishing an elevated observation platform. To establish the platform, the system includes an elongated inflatable envelope. Typically, the envelope is made of a nylon cloth material and is substantially shaped as a truncated cone when fully inflated. With this shape, the elongated envelope extends from a first, relatively large diameter envelope end at the base of the cone to a second, relatively small diameter envelope end.

For the present invention, the system includes a blower for introducing air into the cloth envelope at the first envelope end. During inflation, the first envelope end is maintained at a fixed position relative to a ground location. For example, the first envelope end can be staked, weighted or simply attached to the blower which is then maintained stationary. Also for the

inflatable tower system, an observation device, such as a video camera (or portions thereof), is mounted on the envelope at the second envelope end. The system can further include a hardwired or wireless communication link for transmitting electronic data between the observation device and a ground location.

In one particular embodiment of the system, a plurality of guy wires are attached to the envelope to hold the envelope during inflation and after the envelope has been fully inflated. Typically, this includes a pair of upper guy wires that are staked to the ground and attached to the envelope at the second envelop end, and a pair of intermediate guy wires that are staked to the ground and attached to the envelope between (e.g. midway between) the first and second envelope ends.

In another aspect of the present invention, a method is provided for erecting an inflatable tower to establish an elevated observation platform. For this method, an observation device (e.g. video camera) is first mounted on the cloth envelope at the second envelope end. The envelope is then folded to establish creases at one or more locations between the first and second envelope ends. Next, air is introduced (i.e. blown) into the envelope at the first envelope end to inflate a portion of the envelope between the first envelope end and the first crease. During this inflation, the second envelope end is restrained relative to the first envelope end, for example, by holding one of the upper guy wires. Once the portion of the envelope between the crease and the first envelope end is substantially inflated and oriented vertically, the second envelope end is slowly released (by releasing the upper guy wire) to unfold the crease while simultaneously introducing additional air into the envelope. This additional air inflates the portion of the envelop between the crease and the second envelope end to elevate the second end (and the observation device) relative to the first envelope end. Inflation is then continued until the entire elongated envelope is oriented vertically.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features of this invention, as well as the invention itself, both as to its structure and its operation, will be best understood from the accompanying drawings, taken in conjunction with the accompanying description, in which similar reference characters refer to similar parts, and in which:

Fig. 1 is a perspective view of an inflatable tower system shown in a fully inflated state and with a portion cut away to show envelope thickness; and

Figs. 2A-D are a series of sequential perspective views illustrating a method for erecting the inflatable tower system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, an inflatable tower system for establishing an elevated observation platform is shown and generally designated 10. As shown in Fig. 1, the system 10 includes an envelope 12 that is typically made of nylon cloth or another suitable material which is strong, lightweight and capable of holding an inflation fluid. For the embodiment shown in Fig. 1, the envelope 12 is substantially shaped as a truncated cone when fully inflated. Specifically, the elongated envelope 12 extends from a first, relatively large diameter envelope end 14 at the base of the cone to a second, relatively small diameter envelope end 16.

Continuing with Fig. 1, it can be seen that the system 10 includes a blower 18 for delivering air through a nylon duct 20 and into the cloth envelope 12 at the first envelope end 14. Also shown in Fig. 1, the first envelope end 14 is maintained at a fixed position relative to a ground location using stakes, of which exemplary stakes 22a and 22b have been labeled. Alternatively, the first envelope end 14 can be weighted or simply attached to the blower 18, which is then maintained stationary.

For the system 10, an electronic device 24, such as a video camera (or portions thereof), is mounted on the envelope 12 at the second envelope end 16. For the system 10, the electronic device 24 can include but is not limited to one or more sensors, communications antennas and relay equipment, electronic jamming devices, observation devices such as cameras and radars, and other devices that can take advantage of an elevated position. In addition to the electronic device 24, one or more lights, which can be indicator/warning lights, search lights or flood lights can be mounted on the envelope 12 at the second envelope end 16.

It can further be seen that the system 10 shown in Fig. 1 includes a pair of intermediate guy wires 26a,b and a pair of upper guy wires 28a,b to hold the envelope 12 during inflation and after the envelope 12 has been fully inflated. As shown, each intermediate guy wire 26a,b is secured (e.g. staked) to the ground and attached to the envelope 12 between (e.g. midway between) the first envelope end 14 and the second envelope end 16. Also shown, the upper guy wires 28a,b are attached to the envelope 12 at the second envelope end 16. For the system 10, the upper guy wire 28b can also function as a communication link for transmitting electronic data between the elevated electronic device 24 and a ground station 30. The communication link between the electronic device 24 and a ground station 30 can include conductors (i.e. wires or coaxial cable), one or more fiber optic cable(s), wireless links or a combination thereof. The ground station 30 can include provisions for data input / output including but not limited to displays (such as display 32 shown), a keyboard (not shown), etc.

A method for erecting the inflatable tower system 10 show in Fig. 1 is illustrated in Figs. 2A-2D. For this method, the electronic device 24 (e.g. video camera) is first mounted on the cloth envelope 12 at the second envelope end 16. As illustrated in Fig. 2A, the envelope 12 is then folded to establish creases, such as the crease 34 and crease 36 shown. Theses creases 34, 36 are established at locations between the first envelope end 14 and the second envelope end 16, and preferably as shown, the crease 34 is

established to interpose the attachment location of the intermediate guy wires 26a,b between the crease 34 and first envelope end 14.

Once the creases 34, 36 have been established, air is then introduced (i.e. blown) into the envelope 12 at the first envelope end 14 to inflate the portion 38 of the envelope 12 between the first envelope end 14 and the first crease 34. During this inflation, the second envelope end 16 is restrained relative to the first envelope end 14, for example, by holding the upper guy wire 28a. Due to the crease 34, the portion 38 of the envelope 12 is the first part of the envelope 12 to inflate and, upon inflation, the portion 38 becomes oriented vertically, as shown in Fig. 2B. At this point, the intermediate guy wires 26a,b can be secured to the ground to hold the envelope 12 and maintain the portion 38 oriented vertically.

Once the portion 38 has been substantially inflated and is oriented vertically, the upper guy wire 28a (which was held during inflation of the portion 38) is slowly released and additional air is blown into the envelope 12 through the first envelope end 14. The slow release of the second envelope end 16 while simultaneously introducing additional air into the first envelope end 14 causes the crease 34 to slowly unfold allowing air to inflate the portion 40 of the envelope 12 between the crease 34 and the crease 36, as shown in Fig. 2C. Eventually, with the continued introduction of air and further release of the upper guy wire 28a, the portion 40 becomes substantially inflated and oriented vertically, as shown in Fig. 2D. This process is continued (i.e. continued introduction of air and further release of the upper guy wire 28a) until the portion 42 between the crease 36 and second envelope end 16 becomes substantially inflated and oriented vertically, as shown in Fig. 1. At this point, the upper guy wires 28a,b can be secured to the ground and the electronic device 24 activated.

While the particular inflatable observation tower and method for erecting an inflatable observation tower as herein shown and disclosed in detail are fully capable of obtaining the objects and providing the advantages herein before stated, it is to be understood that they are merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as described in the appended claims.